Magnetostratigraphy and Cyclostratigraphy of the Rainstorm Member of the Johnnie Formation, Desert Range, Nevada

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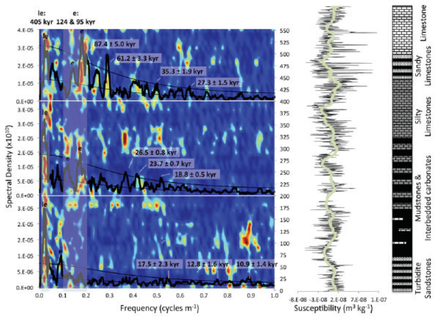
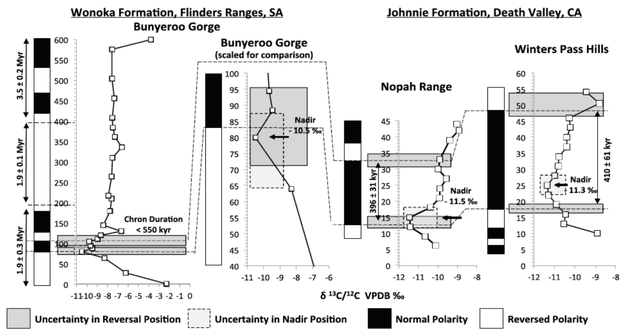
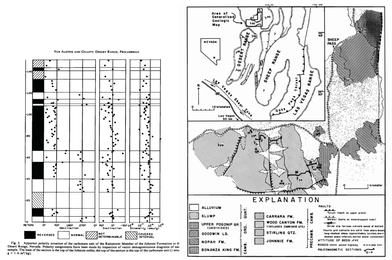


Minguez and Kodama, 2017

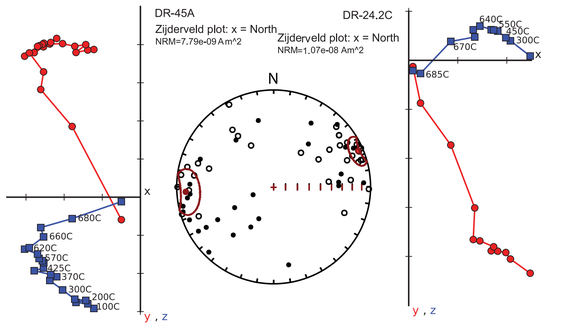


In previous work we used rock magnetic cyclostratigraphy to determine the duration of the Shuram ^{13}C excursion. In Australia and Death Valley we found evidence of a normal polarity interval at the nadir of the excursion. Because of remagnetization of the Doushantuo Fm in China we could not find evidence of the normal polarity event in China. This event is important to confirm because it can be used to test for global synchroneity and a primary origin for the excursion. Currently the main stream interpretation is that the Shuram marks the oxidation of the global ocean.

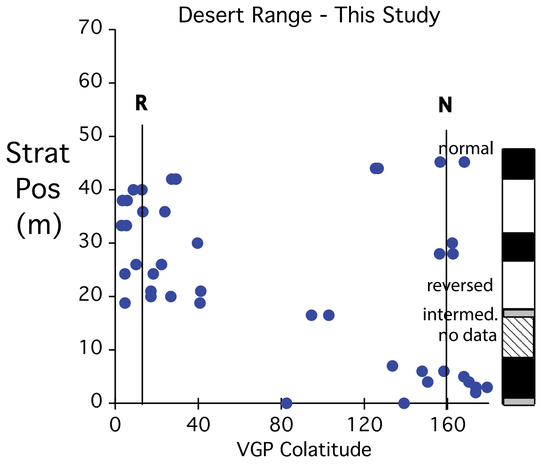


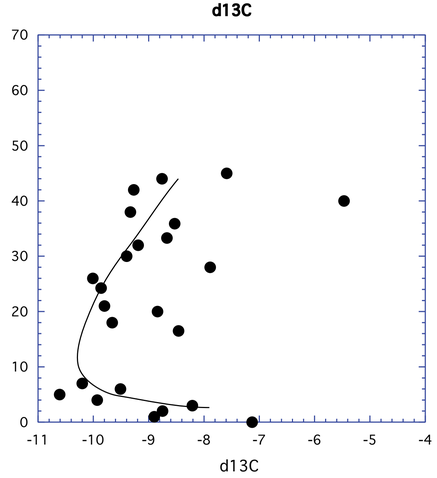
Van Alstine and Gillett, 1979

Van Alstine and Gillett (1979) had conducted a magnetostratigraphy study of the Rainstorm member of the Johnnie Fm in the Desert Range in Nevada, the same unit we studied in Death Valley, so we sampled in the Desert Range. We needed to tie two different sampling localities together for our sampled section. They were tied together by measuring up section from a local marker bed, the Johnnie Oolite.

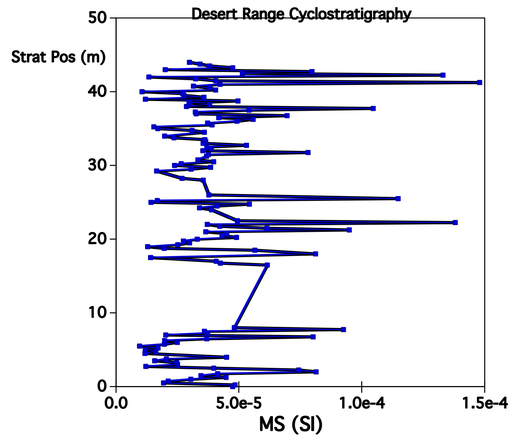


We only had permission from the Air Force to be on Nellis Air Force Base for two days, so we collected oriented samples and cyclostratigraphy samples from 40 m of section. We conducted standard thermal demagnetization and observed two polarities.

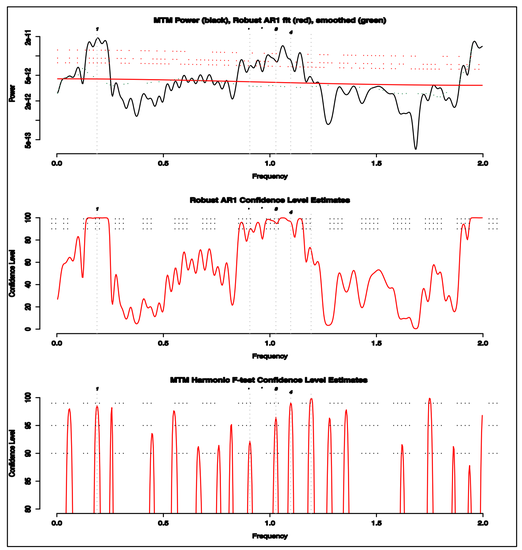


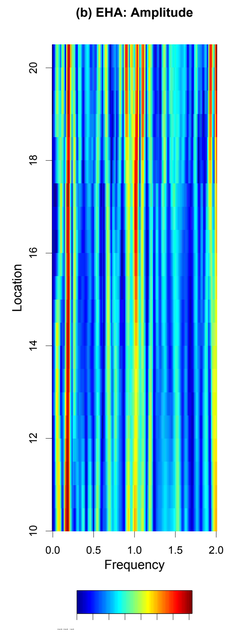


We had ~ 10 m gap in the section we constructed from the rocks available for sampling. The results did show a local magnetostratigraphy. ^{13}C measurements also observed the Shuram C isotope excursion. Unfortunately, the nadir fell in the gap.



Magnetic susceptibility cyclostratigrapy observed cycles in the time series.

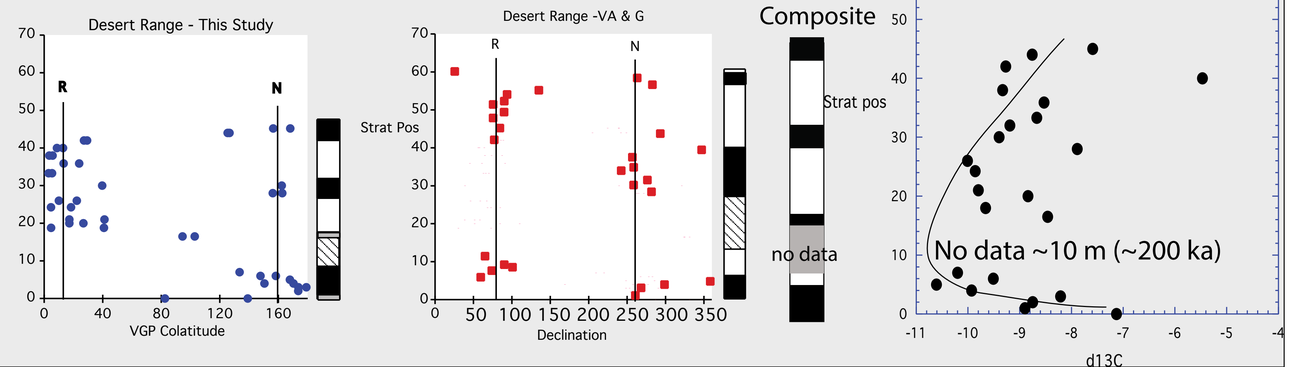




MTM time series analysis with robust red noise (using Astrochron (Meyers, 2014)) showed significant spectral peaks at ~ 5 m (interpreted to be short eccentricity) and ~ 1 m (precession), similar to what we observed in Death Valley. This yielded a sediment accumulation rate (SAR) of ~ 5 cm/kyr. An evolutionary spectrogram shows that the SAR stays constant throughout the section.

Conclusions:

Combining our magnetostratigraphy with Van Alstine and Gillett's previous work suggests that the 10 m gap in the section, correlating with the nadir of the Shuram excursion, could be the location of the normal event, but it is constrained to be ~ 200 ka in duration based on the SAR of 5 cm/kyr determined by rock magnetic cyclostratigraphy. This is shorter than the duration of the normal event in Death Valley.



References Cited

Meyers, S.R., 2014, Astrochron: An R Package for Astrochronology.

Minguez, D. and K.P.Kodama, 2017, Rock magnetic chronostratigraphy of the Shuram carbon isotope excursion: Wonoka Formation, Australia, Geology,

Van Alstine, D. and S. Gillett, 1979, Paleomagnetism of the Upper Precambrian Sedimentary Rocks from the Desert Range, Nevada, Jour. Geophys. Res., 84, 4490-4500.

Joshua Gonzalez conducted the rock magnetic cyclostratigraphy study.